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NOTES ON STREAKINESS IN BLANKET CREPE

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AMONG the samples of rubber which are received at the Research Scheme laboratories for examination a considerable proportion during the last few months has consisted of blanket crepe which was streaky or discoloured.

At a time of falling prices such as the present the market is always more critical than it is under more prosperous conditions, and some of the samples which were rejected by the brokers as streaky would at other times be passed as up to contract quality. Nevertheless streakiness or uneven colouring of blanket crepe is a relatively common defect, and it is not unnatural that this should be the case. Any slight discoloration or variations in colour of the lace crepe, which may hardly be perceptible when the rubber is in this form naturally become more evident when the crepe is rolled to a thick blanket. A method which the writer frequently uses for comparing the colour of two samples of crepe is to blanket the samples together and see whether streakiness results.

Information regarding common causes of streakiness in crepe is given in the recently published "Guide to the Preparation of Plantation Rubber in Ceylon" (pp. 30-32), but it is thought useful to deal rather more fully with certain causes of this defect.

Surface Mould.—During wet weather it is not uncommon for surface mould to develop on the lace crepe during drying. This may be so slight that it cannot be seen on the rubber with the naked eye or it may appear as small specks which are sometimes attributed to dust blowing into the factory. If the mould is severe it can usually be detected by shaking the rubber, when clouds of dust (mould spores) emerge. The presence of mould on the lace crepe will inevitably lead to streakiness or discoloration of the blanket crepe to a greater or less extent. Streakiness of blanket crepe which appears regularly during wet weather will usually be found to be caused by mould (or fungal spots).

Trouble with surface mould on crepe appears to be increasing in Ceylon factories, and it is thought that this is mainly a matter of gradual infection. Drying sheds which have been free from mould for years may gradually become infected and the trouble will then increase progressively.

Apart from raising the temperature of the drying room by artificial means, the most promising method for control of mould is the treatment of the latex with a small proportion of paranitrophenol. The amount required for complete prevention of mould in laboratory tests was found to be 1 part to 1,000 parts rubber, but it is considered that 1 part to 4,000 parts rubber is sufficient to control mould under factory conditions. Particulars of the treatment are given in the "Guide to the Preparation of Plantation Rubber in Ceylon" (p. 52), and it is emphasised there that the only disadvantage of the treatment is that crepe containing P.N.P. becomes discoloured if exposed to *direct* window light during drying. This is a serious drawback but suitable precautions to protect the crepe from direct window light can be taken without involving any appreciable expense or loss of drying space, and the method has been used in several factories during the past year with complete success. A further advantage of treatment with P.N.P. is that the blanket crepe is protected from development of surface mould or fungal spots during storage.

It is considered that mould infection in drying rooms is mainly centred on the floor, where it thrives on the serum which drips from the wet crepe, and on the reapers. In case of trouble with mould it is advisable to treat the floor-boarding with a 10 per cent. solution of "Atlas A" wood preservative which constitutes a fairly permanent disinfectant and to wash the reapers and other woodwork frequently with a 2 per cent. solution of formalin.

In the above discussion no reference has been made to the question of ventilation of the drying shed. It is taken for granted that the room must be well ventilated and that the rubber cannot dry unless there is sufficient circulation of air to remove the moisture. Mould infection may however develop even in a well ventilated drying room under the extremely humid conditions which exist in certain districts during monsoon weather and may necessitate application of the methods of disinfection detailed above.

Light.—It is well known that sunlight causes a brown discoloration of crepe rubber, but it is not so widely recognised that direct window light, other than sunlight, also causes discoloration. Crepe which has been dried near to windows in the drying room is always slightly off-colour and if blanketed together with the remainder of the crepe will cause streakiness. The outside rows of crepe should be taken down and rolled separately.

The discoloration is only caused by *direct* light and not by reflected light so it can be avoided by fitting shades to the drying room windows or by arranging that the crepe is hung in such a way that it is out of contact with the direct rays of light.

The method referred to is to hang the crepe to dry in the form of "mats" such as are usually prepared when crepe rubber is to be dried artificially. The mats are made by rolling the crepe on to a drum (for which a convenient size is 3 ft. wide by $1\frac{1}{2}$-2 ft.

diameter) as it comes from the smooth roller. The mat contains 2-3 layers of crepe and the size and thickness is adjusted so that each mat occupies approximately the same reaper space as an equal weight of crepe hung in the usual way. When the mats are hung on the reapers the crepe is high above the floor and direct light from the windows does not fall on the rubber. Equally important is that circulation of air through the room is much improved. It might be thought that the mats would dry slowly but in practice it is found that they dry as rapidly as crepe hung in the ordinary way. This method of hanging has been in use on certain estates for a number of years, and is being adopted with success by an increasing number of estates. It is particularly useful for drying rooms with poor ventilation as it enables the air to circulate freely through the room.

Iron in Water Supply.—It is frequently stated that the presence of iron in the water used for diluting and coagulating latex leads to discoloration of crepe, and more especially that the rubber rapidly darkens in colour during storage. This observation may be correct under certain conditions but it has not been confirmed by tests made by the writer up to the present time.

According to a text-book on water analysis, "natural waters containing more than about 0·02 part of iron per 100,000 (*i.e.*, 1:5,000,000) usually become opalescent or turbid on exposure to the air, owing to the decomposition and oxidation of the ferrous hydrogen carbonate." This indicates the minute amount of dissolved iron which is likely to be present in water without detection, and it was considered that by preparing crepe from latex diluted with water to which iron salts had been added in proportion 1:100,000, any tendency to discoloration should be very marked.

The following samples were prepared:—

(1) Control crepe.

(2) Crepe from latex diluted with water containing ferric chloride 1:100,000.

(3) Crepe from latex diluted with water containing ferrous sulphate 1:100,000.

There was no appreciable difference in colour of the samples after preparation or after storage for five and a half months.

The other source of contamination with iron is the use of water containing suspended iron from rusty pipes. A sample of such water was obtained and the proportion of iron present found to be 1:75,000. This water was bright red in colour and must be regarded as grossly contaminated.

The following samples were prepared:—

(1) Crepe made from latex diluted with the above water.

(2) Crepe made from latex diluted with the same water after being strained through muslin.

The first sample was distinctly darker than the second (which was perfect in colour), but not more so than would be expected from the direct effect of the colouring matter present in the water. After three months' storage the sample has shown no tendency to abnormal discoloration.

In the writer's opinion the effect of iron on the colour of crepe has been exaggerated and is not likely to be serious except in the case of heavy contamination. It is possible that rapid darkening of crepe during storage which has frequently been ascribed to the effect of iron, is really due to adulteration of the latex by coolies, which is discussed in the next section.

Adulteration of Latex.—A case occurred recently on an estate in which crepe from one division either became streaky during drying and was discoloured when blanketed, or rapidly darkened in colour during storage. Coagulum from seven different divisions was machined and dried in one factory, and the rubber from all except one division was perfect in colour. A number of tests made by the Superintendent, such as diluting the latex with water from a different division, using fresh stocks of bisulphite and acid, carrying the latex to the main factory for coagulation, etc., were sufficient to convince the writer that the discoloration of the rubber was due to adulteration of the latex in some way by the tapping coolies (mostly Sinhalese villagers). Examination of each tapper's latex microscopically and a test for acidity showed no distinct differences, but in the case of small samples of the latex coagulated separately in aluminium cups (without bisulphite), the serum in several cups was found next morning to be pink in colour and the coagulum was discoloured. After this experiment the discoloration of the crepe ceased for several weeks and when it recurred the Superintendent checked it again by threatening to apply his test and to prosecute any tapper whose latex was found to be adulterated. At first sight the simplest course would appear to have been to secure a new gang of tappers, but it was not practicable in this case as there were no cooly lines on the division, and the Superintendent was dependent on his village tappers.

The above incident is recorded in order to show that discoloration of crepe can be caused by adulteration of the latex by tappers, and where discoloration cannot be traced to other causes this possibility should not be overlooked.

Unfortunately the writer has no information regarding the identity of the adulterant used in this case, and would be glad to hear from any Superintendent who has any suggestions on the subject.

In addition to the above causes of streakiness or discoloration of blanket crepe, there are of course the more obvious causes such as errors in treatment of the latex with sodium bisulphite, variations in the colour of the crepe from different jars of latex, failure to remove dirty edges from the crepe, etc., which are dealt with in the Handbook referred to above.

DISEASES OF RUBBER IN CEYLON, 1929.

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1. *Introductory.*—It is thought that an article on diseases of rubber appearing in the 4th Quarterly Circular of each year will be of interest to planters. Such an article will review the general disease position in the Island during the year in question, drawing attention to any new diseases of importance and to any advances in our knowledge of the causation and control of diseases of longer standing.

2. *Root and Collar Diseases.*—As is now well known to all planters, Dr. Small has for some years maintained that the fungi commonly associated with root disease, such as *Fomes*, *Poria*, *Ustulina*, are not primary parasites, *i.e.*, are not capable of attacking unwounded healthy rubber roots. He further maintains that their attack is preceded by another fungus, *Rhizoctonia bataticola*, which is capable of attacking and killing healthy roots. This view has met with support in some quarters and opposition in others, and the comparative importance of the various fungi has not yet been determined. Most mycologists now consider that *Rhizoctonia* is parasitic on Hevea and can cause its death under certain conditions, but that it has not yet been proved to be a necessary precursor to attacks by the other fungi.

In the meantime it is important that the usual methods of root disease treatment be rigorously carried out. This is particularly important at the present time in view of the heavy cover of Vigna on some estates. Many estates in the wetter districts which have had a thick ground cover established for some years are now finding a considerable incidence of *Fomes lignosus* root disease. In every case observed by the writer the outbreak has occurred in the vicinity of old disease areas and can be traced to incomplete treatment in the past. Owing to the presence of a thick cover of Vigna the disease has often spread over a considerable area before it is discovered. It cannot be too strongly emphasized that in treating such areas the limits of the disease on all sides must be found before the isolation trench is dug. The ground within the trench must be thoroughly cleared of all roots down to about the size of a lead pencil, and the roots and Vigna burned *in situ*. This is the only method of insuring that the disease area will not prove a source of infection to neighbouring trees in the future. In addition, an area treated in this way may safely be replanted in a comparatively short time.

Although a thick cover assists the spread of root disease in several ways, it would be a mistake for an estate to deny itself the undoubted advantages to be derived from cover crops because of the possible danger of root disease. The only limitation to be placed on the growth of cover crops is that they should not be grown on areas known to be affected.

In low-country districts *Ustulina zonata* is responsible for more deaths than any other fungus. Some estates have adopted the filling method of treating collar rot advocated in the Rubber Research Scheme 4th Quarterly Circular for 1925, but this can only be successfully carried into operation if the disease is detected at an early stage. In order to render the detection of this disease easier, any ground cover should be kept clear in a circle, about 6ft. in diameter, round the base of the tree. Where *Ustulina* fructifications are present it is a sound practice to paint them over with tar or disinfectant before the branch or trunk is cut. This is particularly important on young fructifications as these bear spores on the surface which are easily blown about and may cause fresh infection.

Other root fungi are of minor importance. Instances of Brown Root (*Fomes lamaoensis*) and *Sphaerostilbe repens* have been reported but these fungi are rarely of serious consequence. *Xylaria furcata* was found on two occasions in circumstances suggesting that it may have caused disease.

In general the position as regards root disease in the Island may be considered satisfactory. Root disease is almost entirely absent from the drier mid-country districts, while in the low-country, although *Fomes lignosus* and *Ustulina* are of wide occurrence, there are comparatively few estates on which large areas are affected. The methods of preventing the spread of root disease show considerable improvement; less reliance is being placed on trenching alone and more attention is being given to the eradication of all diseased roots from an affected area.

3. *Stem Diseases.*—(a) *Bark Rot* continues to cause damage in certain districts but may be almost completely prevented by careful disinfectant painting. Some estates which use Cargilineum Mixture only have suffered from this disease owing to being unable to apply the mixture on trees which have remained almost continuously wet for some days. All estates should have a water-soluble disinfectant in readiness for application under such conditions. (b) *Canker* is prevalent on many estates in the wet districts but is not considered to do much harm except where the actual tapping surfaces are affected. (c) *Brown Bast* is prevalent in the dry districts of Matale and Uva and must be considered as the most serious factor adversely affecting yields in these districts. On some estates the disease is being treated by the scraping and isolation method recommended by the Rubber Research Scheme (R.R.S. Bulletin No. 48), and

in this way many trees are being brought into tapping. It is hoped that if the price of rubber rises, further work of this nature will be done. On one estate in the Kalutara district a rot of recently scraped panels developed despite the application of disinfectants and considerable damage was done.

4. *Leaf Diseases.*—Secondary leaf-fall due to *Phytophthora palmivora* (*P. Faberi*) was more severe in some districts than in 1928, but its occurrence in Ceylon is not sufficiently severe to cause alarm. It is probable that cultivation and manuring will lessen the effects of this disease.

Oidium leaf disease has been the subject of special investigation by the Rubber Research Scheme and an article on the subject was written in the 2nd Quarterly Circular for 1929. The disease is widespread in all the rubber-growing areas but has not caused any serious defoliation in the main low-country districts. In the dry districts of Uva and Matale, however, the disease is extremely severe and many estates have suffered considerable defoliation. Although no decreases in yield are yet evident as the result of *Oidium*, such a disease which causes severe defoliation and consequent die-back of branches must be regarded as extremely serious, and an effective means of control is urgently needed.

It is probable that applications of nitrogeneous manure will ameliorate the worst effects of the disease. Such a method, however, exercises no direct control over the fungus and the best hope of eradicating the disease lies in dusting with sulphur powder. In Java, where *Oidium* leaf disease has been present since 1918, extremely successful results have recently been obtained by projecting finely-divided sulphur powder on to the foliage by means of a motor duster. The method is quick and cheap compared with wet spraying and will probably solve the problem of *Oidium* control. Special interest is therefore attached to dusting experiments to be conducted in Ceylon early in 1930.

5. *Diseases and Pests in Nurseries.*—The recent increase in the use of valuable bud-grafted material has drawn attention to the various affections to which young shoots are prone.

In the R.R.S. 3rd Quarterly Circular for 1929 attention was drawn to a new disease of bud-shoots caused by *Phytophthora* sp. The green shoot is attacked a few inches below the extremity and dies back rapidly to the extent of the latest growth increment where the disease may be checked. The disease has not been reported from any estate on a large scale and is probably to a great extent dependent on wet weather conditions. Inoculation experiments have shown that seedlings may also be attacked by the fungus, though the disease has only been reported as occurring in nature on bud-grafts.

If the disease appears in the nursery or the field all affected shoots should be cut off about 6 inches below the margin of the discoloured area and neighbouring shoots sprayed with Bordeaux Mixture.

There are several other adverse factors which check the growth of young budded plants. *Mites* cause damage to young leaves and are most effectively controlled by dusting with sulphur powder or spraying with *Sulfinette*. *Slugs* are often found to eat off the terminal shoot, and damage to leaves has also been attributed to *beetles*. In addition it is probable that the dying back of young rootlets consequent upon cutting back the stock often finds its reflection in a check in growth of the bud-shoot.

6. *Cover Crops*.—The Kalutara snail is still causing considerable damage to Vigna in some districts, and no infallible method of control has yet been devised. The "lime-Atlas" treatment for poisoning the snails recommended by Mr. Roy Bertrand in *The Tropical Agriculturist* for September 1928 has been found successful on some estates, though other Superintendents have had no appreciable results. Hand collecting and destroying the snails is still considered to be the most effective remedy.

Vigna is commonly attacked by two fungi, though in neither case is the disease of a serious nature. *Rhizoctonia solani* kills back the Vigna in small circular patches in wet weather, but these soon recover in a dry spell. A brown spotting of Vigna leaves has been shown to be due to *Uromyces* sp., a rust fungus. The leaflets turn yellow and fall and in very dry weather the cover may be killed back.

NOTICES.

SUBSCRIPTIONS.

Arrangements have now been made for Bulletins and Circulars of the Ceylon Rubber Research Scheme to be made available to non-contributors to the Scheme at the rate of Rs. 15·00 per annum, post free.

GLASS HYDROMETERS.

Glass hydrometers for testing latex and for testing formic acid as specified and as recommended by the Rubber Research Scheme (Ceylon) may be obtained at a cost of Rs. 12·50 and Rs. 10·50 each respectively, from :—

Messrs. WALKER, SONS & Co., Ltd.,
Engineering & Estate Supplies Department,
Colombo.